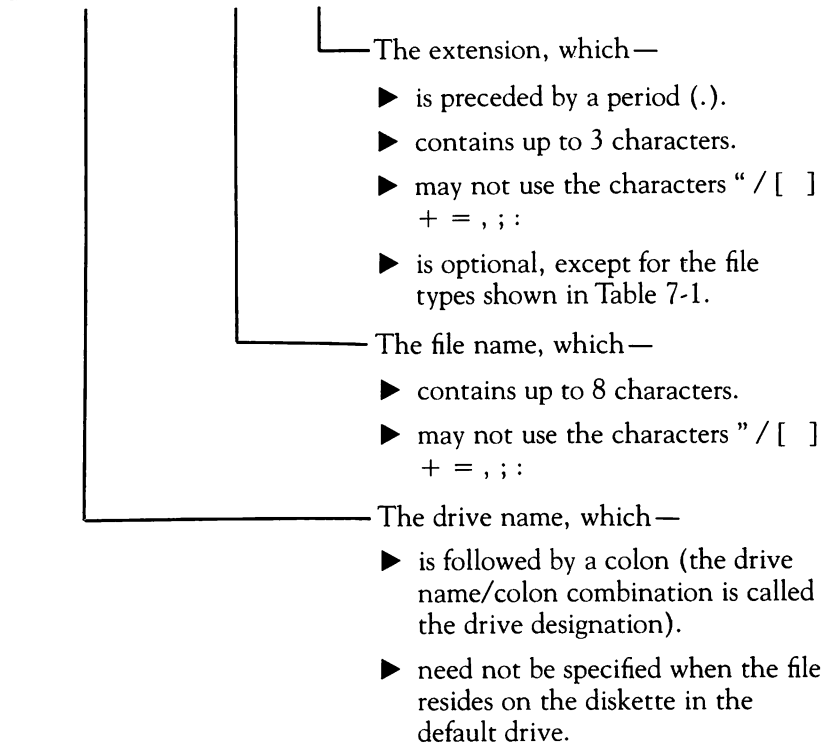
7-2: File Specifier Structure

drivename:filename.ext



7

MS-DOS File Extension Conventions 7.3.2

MS-DOS automatically defines the meanings of several file extensions. The file extensions defined by MS-DOS are presented in Table 7-1.

Extensions other than those automatically defined by MS-DOS or your application program can be assigned at your discretion. For example, you might use the extension .TXT for all text files.

Table 7-1: MS-DOS File Extension Conventions

FILE EXTENSION	MS-DOS INTERPRETATION
.ASM	8086 assembly language source code
.BAK	Backup file created by application program
.BAS	BASIC source code (Microsoft BASIC)
.BAT	Batch command file
.COB	COBOL source code
.COM	Executable command file
.DAT	Data file (assumed to be ASCII)
.EXE	Relocatable executable file
.FOR	FORTRAN source code
.INT	Intermediate compiled code
.LIB	Library file
.LST	Listing of compilation or assembly
.MAP	List file from linker
.OBJ	Relocatable object code module
.OVR	Overlay module
.PAS	PASCAL source file
.PRN	Listing of compilation or assembly
.CRF	Cross-reference
.$$$	Temporary system-generated file

7.3.3 Wild-Card Characters

MS-DOS wild-card characters allow you to use a single command to affect a group of files.

MS-DOS wild-card characters are similar to wild cards in card games in that the wild-card characters take on the meaning that you assign to them.

The two MS-DOS wild-card characters are the question mark (?) and the asterisk (*).

The ? wild-card character means "match any character—or no character—in this particular location in the file name or file extension." For example, PAY-???.ROL matches each of these file specifiers:

PAY-JAN.ROL
PAY-FEB.ROL
PAY-MAR.ROL
PAY-JL.ROL

The * wild-card character means "pad with ?s." This enables you to refer to entire families of files. For example, *.BAS refers to all files with the extension .BAS. WS*.* refers to any file whose file name (no matter how long) starts with WS, regardless of extension.

The * character pads all possible characters that follow it, within the file name or the extension where it appears. This means that MS-DOS cannot read or match any characters following the * in a file name or extension. For example, *86.EXE matches all files with extension .EXE (????????.EXE), not just files whose names end in 86 and have the extension .EXE.

Wild-card characters can be used in combination. For example, ?TEST.* refers to all files whose file name is four or five characters long, the last four of which are TEST, regardless of file extension.

Note that the file specifier *.* refers to all files.

Device File Names 7.3.4

MS-DOS uses certain 3-letter file names for the names of devices:

- AUX refers to input from or output to an auxiliary device.

- CON refers to keyboard input or output to the terminal screen.
- LST refers to the line printer.
- NUL does not refer to a particular file or device. NUL is used when the syntax of a command requires an input or output file name.

Even when given drive designations or file extensions, these file names remain associated with the devices listed above. Thus, CON refers to the terminal console, not a disk file. This results from MS-DOS's device independent I/O, and permits you to treat devices as if they were files.

7.3.5 The File Directory

A diskette's file directory contains information about each file on the diskette. This information includes the file's complete file specifier, its size, and the time and date of its last modification. When you create or delete a file, MS-DOS automatically adds its name to or deletes its name from the directory.

The DIR command is used to display a diskette's file directory (as described in Chapter 9).

7.4 COMMAND LINE EDITING

The command line is created and altered by entering—

Alphanumerics
Punctuation
Special editing functions
Alternate character functions

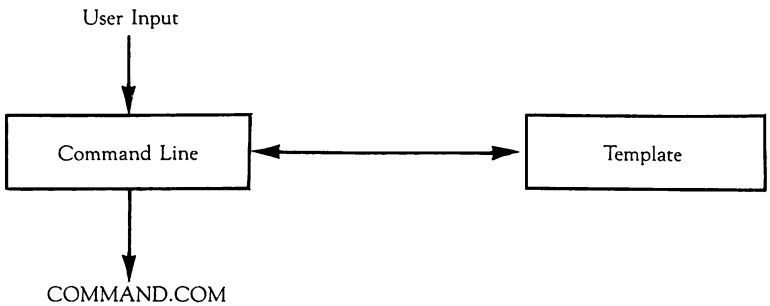
The special editing and alternate character functions can be used whenever terminal input is required. These functions are always resident in the operating system.

The model for command line input is as follows:

- When text is entered from the keyboard, it is held in the command line buffer until the Return key is pressed.
- A Return sends the contents of the command line to COMMAND.COM for processing.
- A Return also copies the command line to the "template," another buffer intimately related to the command line buffer.

The relationship between the command line and the template is shown in Figure 7-3.

7-3: The Command Line and the Template



With the MS-DOS special editing functions, you can use the template to—

- Instantly repeat a command line in two key strokes.
- Edit and retry an erroneous command line, without reentering the entire command line.
- Edit and execute a command line similar to a preceding command line with a minimum of typing.

7.5 SPECIAL EDITING FUNCTIONS

Table 7-2 lists the MS-DOS special editing functions. These functions are accomplished by entering the escape sequences listed in Table 7-2 (and the additional specified character, or characters, if necessary). The function keys on your keyboard can also be programmed to perform the special editing functions. Your dealer can provide you with a programmer's tool kit that allows such use of the function keys.

Table 7-2: Special Editing Functions

FUNCTION NAME	ESCAPE SEQUENCE*	EDITING EFFECT
C1	Escape S	Copies one character from the template to the command line.
CM	Escape T	Copies all characters up to the specified character from the template to the command line.
CT	Escape U	Copies all remaining characters in the template to the command line.
S1	Escape V	Skips over (does not copy) a character in the template.
SM	Escape W	Skips over (does not copy) the characters in the template up to the specified character.
QI	Escape H	Voids the current input; leaves the template unchanged.
INS	Escape P	Enters insert mode.
REP	Escape Q	Exits insert mode; the REP mode is the default mode.
NT	Escape R	Makes the new line the new template.

* The escape sequences listed in this column are accomplished by pressing the Escape key and then pressing the specified letter key. The letter keys must be typed in upper case.

ALTERNATE CHARACTER FUNCTIONS 7.6

Seven alternate characters may be used while entering command lines. These alternate characters and their functions are shown in Table 7-3.

Table 7-3: Command-Line Alternate Character Functions

ALT SEQUENCE	FUNCTION
ALT-C	Aborts current command.
ALT-H or Backspace	Removes last character from command line, and erases character from terminal screen.
ALT-J	Inserts physical end-of-line, but does not empty command line. Uses line feed to extend the current logical line beyond the physical limits of one terminal line.
ALT-N	Cancels echoing of output to line printer.
ALT-P	Echoes terminal output to the line printer.
ALT-S	Suspends display of output to terminal screen. Console (and printer, if output is being echoed to the printer) remains frozen until any key is pressed.
ALT-X	Cancels the current line, empties the command line, and outputs a back slash, carriage return, and line feed. The template is not affected.

COMMAND INTERPRETATION 7.7

COMMAND.COM processes and interprets the MS-DOS commands. Command interpretation begins when COMMAND.COM scans the command line for the name of a legal command.

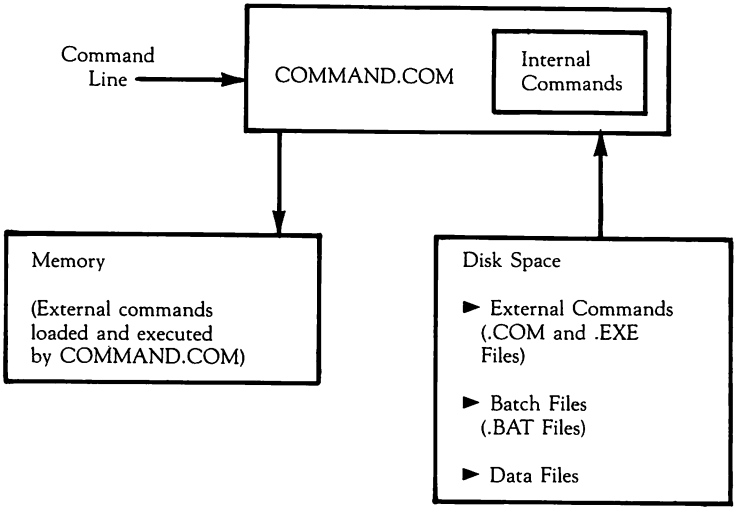
Commands themselves are of two types: internal and external. Internal commands are part of COMMAND.COM; they are

loaded into memory when the operating system is loaded. External commands reside in files that have a .COM or an .EXE extension. They are loaded from diskette only when needed.

Batch command files (.BAT files) may contain both internal and external commands (see "Batch Commands"). As with external commands, batch files are loaded from diskette when needed.

The command interface is illustrated in Figure 7-4.

7-4: The MS-DOS Command Structure



COMMAND.COM provides MS-DOS's characteristic command prompt— a one-letter drive name and a greater-than symbol (i.e., A> or B>).

7.7.1 Internal Commands

The internal commands are always available when COMMAND.COM resides in memory. The internal commands need not be available on disk when they are executed.

The internal commands are listed here. Their use is described in Chapter 9.

COPY	REM
DATE	REN
DEL	TIME
DIR	TYPE
PAUSE	TOD
	?

External Commands 7.7.2

Any file with the extension .COM or .EXE is an external command. The following external commands are described in Chapter 8:

CHKDSK.COM	FORMAT.COM
DCOPY.COM	RDCPM.COM

Batch Commands 7.7.3

The MS-DOS batch facility allows processing of files containing "batches" of commands. The commands in batch files are processed as if they were typed at a terminal. Each batch file must be named with the .BAT extension. You submit a batch file for execution by entering its file name (without the .BAT extension), optional command parameters, and a Return:

[drivename:]filename [parameter...] ↵

For example, a batch file named NEWDISK.BAT might contain these commands:

```
REM THIS IS FILE NEWDISK.BAT ↵
REM (THE .BAT EXTENSION MUST BE GIVEN) ↵
PAUSE INSERT DISK IN DRIVE B ↵
FORMAT B:/S ↵
DIR B: ↵
CHKDSK B: ↵
```

To execute this .BAT file, you would simply enter NEWDISK and press the Return key. The result would be as if you had entered each of the lines in the .BAT file individually.

By creating a .BAT file with prototype commands containing positional parameters, parameters may be passed to the .BAT file when it is executed. You may specify up to 10 positional parameters, named %0 through %9. (Positional parameters are particularly useful when used with the MS-DOS linker and compilers.)

The parameters are substituted in their order on the invocation line for corresponding occurrences in the batch file. If the dummy parameter %0 is used, the batch facility substitutes the name of the batch command itself for parameter %0. Thus, you can create batch commands that can be used on more than one set of files, and that can be used to reexecute themselves.

For example, you might use BASCOM, the MS-BASIC compiler, to create a file containing—

```
REM THIS IS FILE COMPFILE.BAT ↵
REM START BATCH COMPILE ↵
BASCOM %1;↵
LINK %1;↵
```

To invoke this file, substituting the program DEMO for the positional parameters, you would enter the command—

```
COMPFILE DEMO ↵
```

The result would be as if you had entered the following—

```
REM THIS IS COMPFILE.BAT ↵
REM START BATCH COMPILE ↵
BASCOM DEMO; ↵
LINK DEMO; ↵
```

When you load MS-DOS, COMMAND.COM searches for the file AUTOEXEC.BAT. If a file with that name exists, it is automatically processed, and the startup TIME and DATE commands are then bypassed. If COMMAND.COM does not find AUTOEXEC.BAT, it displays the normal MS-DOS prompt.

Two MS-DOS commands are available expressly for use in batch files: REM and PAUSE. REM permits the inclusion of remarks in batch files. PAUSE prompts you with an optional message and permits you to abort execution of a batch file at a given point. REM and PAUSE are further described in Chapter 9.

8

MS-DOS DISKETTE MANAGEMENT

MS-DOS includes four utilities for managing diskettes:

- FORMAT formats diskettes for system use and, optionally, creates a new system diskette.
- DCOPY copies a diskette's contents onto another diskette.
- CHKDSK scans the directory of a diskette and checks it for consistency.
- RDCPM transfers files from a CP/M-86 diskette onto an MS-DOS diskette or displays the directory of a CP/M-86 diskette.

THE FORMAT UTILITY 8.1

Command Format and Function 8.1.1

The command format for the FORMAT utility is—

FORMAT [drivename:] [/c][/d][/e][/i][/z] ↵

where *drivename* is the name of the drive containing a diskette to be formatted, and /C, /D, /E, /I, and /Z are the command "switches."

The FORMAT program prepares diskettes to receive data. In the process, FORMAT automatically erases any previous files on the diskette. New diskettes must be formatted before they can be used.

8.1.2 Command Operation

When you load FORMAT (by entering the FORMAT command), the utility displays its one-line sign-on banner. While FORMAT is running, it displays the number of the track it is formatting at the bottom of the screen. (Your computer's diskettes contain 80 tracks on a side.)

The Drive Name Parameter

If you do not designate a drive name with the FORMAT command, FORMAT prompts you—

- To enter the name of the drive containing the diskette to be formatted.
- To press the space bar to start the format process.
- To repeat the process once the format is complete. (To exit FORMAT, you press the Return key.)

You can thus continue to format diskettes without reloading FORMAT. (After you load FORMAT, you can remove the system diskette from drive A and then use both drives for formatting diskettes.)

If you designate a drive name with the FORMAT command, FORMAT simply formats the designated diskette and exits to the operating system.

The Command Switch Parameters

You can expand the FORMAT command by using five command switches:

- /C displays the total number of soft errors found and the amount of space available on the diskette.

- /D formats a double-sided diskette.
- /E displays the locations of soft errors encountered, the total number of soft errors found, and the amount of space available on the diskette. The /E switch implies the /C switch.
- /I clears the diskette's directory and file allocation tables only. You must use a diskette that has already been formatted with this switch. The switch causes the program to skip its formatter portion.
- /Z displays disk zone information (size of tracks and gaps).

You may use FORMAT switches in combination. For example, the command—

FORMAT B: /E/D ↵

would format both sides of the diskette in drive B and display the locations and total numbers of the soft errors encountered. (Note that if the /I switch is specified, the /D, /E, and /Z switches have no meaning and are ignored.)

Diskette Tracks, Zones, and Soft Errors

Switches /E, /C, and /Z display information about diskette tracks, zones, and soft errors. Tracks are circular sections of a diskette; your computer's diskettes have 80 tracks on a side. These tracks are grouped into eight zones; the drive motor runs at a different speed on each zone. Soft errors are worn or flawed spots on the diskette that may make it unreliable for use. The /C switch (for counting soft errors) allows you to gauge the reliability of a diskette for recording data. If 15 or more soft errors appear, repeat the FORMAT process a few times. If this number of errors persists, discard the diskette and try another.

8.1.3 Command Examples

The examples in this section show FORMAT prompts and messages consecutively, as they appear on the screen. The examples do not indicate where on the screen the prompts and messages are displayed.

The following example illustrates using FORMAT without parameters.

```
A>format ↵

Diskette FORMAT Utility—Version ms1.1-07 82.10.30

Format drive? (A or B; press return key to end)b

Format drive B. Press space bar when ready. ␣

Format drive B complete.

Format drive? (A or B; press return key to end) ↵

A>■
```

8.2 THE DCOPY UTILITY

8.2.1 Command Format and Function

The command format for the DCOPY utility is—

DCOPY [drivename: to drivename:] [/C][/E][/Z] ↵

where the first drive name is the name of the drive containing the diskette to be copied from, the second drive name is the name of the drive containing the diskette to be copied to, and /C, /E, and /Z are command switches.

DCOPY copies the contents of one diskette onto another diskette, creating a literal twin of the original diskette. In the process, DCOPY formats the new diskette (eliminating the need to run FORMAT separately). NOTE: DCOPY does not work with Hard Disk Volumes.

Command Operation 8.2.2

When you load DCOPY (by entering the DCOPY command), the utility displays its one-line sign-on banner. While DCOPY is running, it displays the number of the track it is copying at the bottom of the screen. (Your diskettes contain 80 tracks on a side.)

The Drive Name Parameter

If you do not designate the copy-from and copy-to drive names with the DCOPY command, DCOPY prompts you—

- To enter the name of the drive containing the diskette to be copied.
- To press the space bar to start the copy process.
- To repeat the process once the copy is complete. (To exit DCOPY, you press the Return key.)

You can thus continue to copy diskettes without reloading DCOPY. (After you load DCOPY, you can remove the system diskette from drive A and then use both drives for copying diskettes.)

If you designate the copy-from and copy-to drive names with the DCOPY command, DCOPY simply copies the designated diskette and exits to the operating system.

Unless you are copying your system diskette, use DCOPY without drive name parameters. Otherwise, the copy process will begin

before you can safely remove your system diskette and replace it with the copy-to or copy-from diskette.

The Command Switch Parameters

You can expand the DCOPY command by using three command switches:

- /E displays the locations of soft errors encountered and the total number of soft errors found. (Soft errors are described in 8.1.) The /E switch implies the /C switch.
- /C displays the total number of soft errors found.
- /Z displays disk zone information (size of track and gaps; tracks and gaps are described in 8.1).

You may use DCOPY switches in combination. For example, the command—

DCOPY B: TO A: /C/Z ↵

would copy the contents of the diskette in drive B onto the diskette in drive A and display disk zone information and the total number of soft errors found.

8.2.3 Command Examples

The examples in this section show DCOPY prompts and messages consecutively, as they appear on the screen. The examples do not indicate where on the screen the prompts and messages are displayed.

The following example illustrates using DCOPY without parameters.

```
A>dcopy ↵

Diskette COPY Utility—Version ms1.0-05 82.10.07
```

```
Copy from FLOPPY drive? (A or B; press return key to end)a

Copy from FLOPPY drive A to drive FLOPPY B.
Press space bar when ready.

Copy from FLOPPY drive A to drive FLOPPY B complete.

Copy from FLOPPY drive? (A or B; press return key to end)↵

A>■
```

The following example illustrates using DCOPY with the /C and drive name parameters.

```
A>dcopy a: to b: /c ↵

Diskette COPY Utility—Version ms1.0-02 82.05.25

Dcopy complete. 80 tracks copied: 0 soft errors.

A>■
```


THE RDCPM UTILITY 8.3

The RDCPM utility allows you to transfer files from a CP/M-86 diskette onto an MS-DOS diskette or to display the directory of a CP/M-86 diskette while using MS-DOS.

Transferring CP/M-86 Files With RDCPM 8.3.1

The command format for transferring files from a CP/M-86 diskette onto an MS-DOS diskette is—

[drivename:]RDCPM drivename:filename.ext ↵

where *drivename* represents the name of the drive containing the MS-DOS diskette and *drivename:filename.ext* represents the file specifier of the CP/M-86 file you wish to transfer.

You may use wild-card characters in the file name and extension of the file to be transferred.

When MS-DOS has transferred all files, it displays the message—

File transfer complete

and returns control to the operating system command level.

The following example illustrates transferring all files with the file name ALPHA on the CP/M-86 diskette in drive B onto the MS-DOS diskette in drive A.

```
A>rdcpm b:alpha.* ↵

Read CP/M Disk Utility—Version 1.7

File transfer complete

A>■
```

8.3.2 Displaying a CP/M-86 Diskette Directory With RDCPM

The command format for displaying the directory of a CP/M-86 diskette while using MS-DOS is—

[drivename]RDCPM DIR drivename:[filename[.ext]] ↵

where *drivename* specifies the drive containing the MS-DOS diskette and *drivename:[filename[.ext]]* specifies the drive containing the CP/M-86 diskette and (optionally) the files to be listed. For example, the command—

A:RDCPM DIR B: ↵

would display the directory of the CP/M-86 diskette in drive B. The command—

A:RDCPM DIR B:ALPHA.* ↵

would display the directory entries for all files with the file name ALPHA on the CP/M-86 diskette in drive B.

Displaying the directory of the CP/M-86 diskette allows you to determine which files need to be transferred to the MS-DOS diskette.

THE CHKDSK UTILITY 8.4

The command format for CHKDSK is—

CHKDSK [drivename:]↵

where *drivename* represents the name of the drive containing the diskette you wish to check. If you do not designate the drive, CHKDSK checks the diskette in the default drive.

CHKDSK scans the designated diskette's directory and checks it for consistency. If CHKDSK finds an error, it tries to correct it and continues checking the diskette. After checking the diskette, CHKDSK displays the appropriate error messages (if any) and a status report on the amount and availability of diskette and memory space.

The following example illustrates using CHKDSK to check a diskette in drive B while using drive A.

```
A>chkdsk b: ↵

  620544 bytes total disk space
   43008 bytes in 2 hidden files
  278528 bytes in 16 user files
  299008 bytes remain available on disk

   99184 bytes total memory
   87792 bytes free

A>■
```

8.5 THE SETIO UTILITY

SETIO is a utility program to display or change the I/O byte. The I/O byte associates a logical device with a physical device.

SETIO has three modes. If invoked without parameters, the assignment table is displayed. If invoked with an invalid device assignment, the command format is displayed with the assignment table. If invoked with a valid device assignment, an updated table is displayed with the new assignment.

Examples: (Highlighted fields are enclosed in brackets [ ].)

A>setio ↵ (without parameters)

```
Logical Device          Physical Devices
    CON                 TTY CRT BAT UL1
    AUXIN               TTY PTR UR1 UR2
    AUXOUT              TTY PTP UP1 UP2
    LST                 TTY CRT LPT UL1
```

A>setio ? ↵ (NOTE: ? is an invalid parameter.)

```
SET I/O VERSION n.n
usage: SETIO [<logical device> = <physical device>]

    CON                 TTY[CRT]BAT UL1
    AUXIN               [TTY]PTR UR1 UR2
    AUXOUT              [TTY]PTP UP1 UP2
    LST                 TTY CRT LPT[UL1]
```

A>setio lst = tty ↵ (valid parameters)

```
SET I/O VERSION n.n

    CON                 TTY[CRT]BAT UL1
```

```
AUXIN                    [TTY]PTR UR1 UR2
AUXOUT                   [TTY]PTP UP1 UP2
LST                      [TTY]CRT LPT UL1

A>
```

Table 8-1: Logical and Physical Devices

DEVICE TYPE/NAME	DESCRIPTION
Logical Devices	
CON:	Console device—the principal interactive console which communicates with the operator. Typically, CON: is a device such as a CRT or teletype.
LST:	List device—the principal listing device; usually a hard-copy device, such as a printer or teletype.
AXIN:	Auxiliary input device.
AXOUT:	Auxiliary output device.
Physical Devices	
TTY:	Serial output-port A (teletype-style printer—RS-232-C)
CRT:	Keyboard and cathode ray tube display
LPT:	Parallel port printer (Centronics)
UL1:	Serial printer—port B (RS-232-C)
BAT:	Batch mode-reader (AXI:) as input; a printer (LST:) as output.
UC1:	External console (to be developed)
PTR:	High speed read (to be developed)
UR1:	(To be developed)
UR2:	(To be developed)
PTP:	High speed punch (to be developed)
UP1:	(To be developed)
UP2:	(To be developed)

8.6 THE SYSCOPY UTILITY

The SYSCOPY utility is used to copy an operating system onto a diskette or virtual volume. You can then use the diskette or volume to load (boot) the operating system.

The operating system is copied from either an existing system diskette/volume or a file created by the system configuration process. (The system configuration process is described in the Programmer's Tool Kit, Volume I.)

To boot with a virtual volume, you must select the volume as the primary boot volume in the HDSETUP utility—as well as copy the operating system onto the volume with SYSCOPY. If you copy the operating system onto the existing primary boot volume, the newly copied system will be used next time you boot from the hard disk.

8.6.1 Command Syntax

The SYSCOPY syntax is—

SYSCOPY source [destination]

where source is the diskette, volume, or file that contains the operating system, and destination is the diskette or volume onto which the operating system is to be copied.

8.6.2 Command Operation

You can specify the source in two forms: a drive specification (e.g., A:) indicates the source is an existing system diskette or volume; a file name indicates the source is the specified operating system file (created during system configuration). If you give a file name without an extension or drive letter, the system assumes the extension SYS and the default drive.

In addition to the operating system, the source drive must contain the file COMMAND.COM. This file is copied with the operating system.

Specify the destination by giving the destination drive letter and a colon only. If you specify the destination with the command, the program terminates after the copy is complete. (Because no user interaction is necessary, you can use this form in a batch command.)

If you do not specify the destination with the command, the utility prompts you for it. After you respond to the prompt, the utility displays your response for verification. After the copy is complete, you are prompted for another destination.

Command Examples 8.6.3

The following example illustrates copying the operating system and COMMAND.COM from drive A to drive B. The source is the system diskette or system volume assigned to drive A.

```
A>SYSCOPY A: B:

SYSCOPY - Version x.x  yy.mm.dd

A>
```

The following example illustrates copying the operating-system file MSDOS.SYS and COMMAND.COM from the diskette or hard disk volume assigned to default drive (drive C) to the diskette or hard disk volume assigned to drive B.

```
C>SYSCOPY MSDOS B:

SYSCOPY - Version x.x  yy.mm.dd

C>
```

The following example illustrates copying the operating-system file MSDOS.NEW and COMMAND.COM from the diskette or hard disk volume assigned to drive C to the diskette assigned to drive F. It also copies them to the hard disk volume (named MYVOLUME) assigned to drive B.

```
A>SYSCOPY C:MSDOS.NEW

SYSCOPY - Version x.x  yy.mm.dd

Destination drive ? ( A-F; press return to end.) F
Copy to F: (FLOPPY). Press space bar when ready. <space>
Copy completed.

Destination drive ? ( A-F; press return to end.) B
Copy to B: (MYVOLUME). Press space bar when ready.
<space>
Copy completed.

Destination drive ? ( A-F; press return to end.) <return>
A>
```

8.6.4 Error Messages and Recovery

Bad parameter on command line — <bad param>

The indicated parameter <bad param> is not correct. Correct the command and redo it. The most common parameter errors are —

- No parameter specified. <source> must be on the command.
- Invalid drive. The drive specified must be assigned.
- Bad destination. The destination specified is not a drive.
- Too many parameters. More than source and destination typed.

Cannot Open MSDOS.SYS

The specified source drive is not a bootable diskette or volume. Specify either a bootable volume, or a source file name.

Cannot Open <source file name>

The specified source file name cannot be opened. Make sure you typed the name correctly and that it is on disk.

Cannot Open COMMAND.COM

The source drive does not have COMMAND.COM. Use the COPY command to copy COMMAND.COM from a bootable volume onto the source drive.

Cannot Create MSDOS.SYS

—or—

Cannot Create COMMAND.COM

There is no room left in the directory of the destination drive. Delete some files and try again.

No space for MSDOS.SYS

There is no room on the disk for MSDOS.SYS (the system image). Delete some files and try again. Note that MSDOS.SYS must reside on contiguous disk space. Thus if the diskette or volume is "checker boarded" (i.e., small, noncontiguous disk spaces available) you may have to delete many files. In this case, it is probably best to start with a newly formatted diskette or a completely empty volume; first do the SYSCOPY and then use the COPY command to copy the rest of the files.

No space for COMMAND.COM

There is no room on the destination disk for COMMAND.COM. Check the size of COMMAND, using the DIR command, and remove enough files from the destination drive to make room.

8.6.5 Unexpected Termination

This is applicable only if the destination drive is a hard disk volume. In order to prevent leaving the hard disk in an inconsistent state, when a copy is started whose destination is a hard disk volume, the system information which points to the boot image is cleared. This information is reinstated when the copy is completed. Thus, if a failure occurs during a copy to a hard disk volume (i.e., while the message "Copying..." is being displayed), you will not be able to boot from the hard disk. You will have to boot from the floppy. This condition will be corrected after the next successful SYSCOPY or assignment in HDSETUP. It is therefore very important that you keep a copy of the hard disk operating system, with its utilities, in a safe and handy place.

9

THE MS-DOS INTERNAL COMMANDS

INTRODUCTION 9.1

The MS-DOS internal commands are presented in Table 9-1 and then described in detail.

Table 9-1: MS-DOS Internal Commands

COMMAND NAME	COMMAND FUNCTION
COPY	Copies specified file(s).
DATE	Sets and displays date.
DEL	Deletes specified file(s).
DIR	Lists specified directory entries.
PAUSE	Pauses for input in a batch file.
REM	Displays a comment in a batch file.
REN	Renames a file.
TIME	Sets and displays the time.
TOD	Displays the time and date.
TYPE	Displays the contents of the specified file.
?	Displays the current System drive and COMMAND version number.

THE COPY COMMAND 9.2

Command Format and Function 9.2.1

The command format for COPY is—

COPY *filespec*[+*filespec*...] [/A|/B] [*filespec*] [/A|/B] ↵

The COPY function is to copy the first file (or files) specified onto the second file specified.

9.2.2 Command Operation

File Specifier Parameters

If the second file specifier is not given, the copy is on the default drive and has the same name as the file copied.

If the first file specifier is on the default drive and the second file specifier is not given, the copy is aborted. (Copying files to themselves is not allowed.) MS-DOS returns the error message:

File cannot be copied onto itself
0 File(s) copied

The second file specifier may take three forms:

- A drive designation only causes the original file to be copied with the same name to the designated drive.
- A file name only causes the original file to be copied to a file with the name specified on the default drive.
- A full file specifier causes the original file to be copied to a file with the name specified on the designated drive.

File Concatenation

You can concatenate files by simply listing any number of files as parameters to COPY, separating them by a plus sign (+).

For example, the command—

COPY A.XYZ+B.COM+B:C.TXT BIGFILE.CRP ↵

would concatenate the contents of A.XYZ, B.COM, and B:C.TXT and place them in the file on the default drive called BIGFILE.CRP.

The /A and /B Switches

Concatenation is normally carried out in text (or ASCII) mode, which means that an ALT-Z (1A hex) in the file is interpreted as the end-of-file mark. To combine binary files, use the /B switch, which forces the command to use the physical end-of-file as the end of file (that is, the file length seen in the DIR command).

For example, the command—

COPY/B A.COM + B.COM ↵

would concatenate the binary files A.COM and B.COM (since a second file specifier is not given with the command, the resulting file would be named A.COM).

ASCII and binary files may be arbitrarily combined by using /B on binary files and /A on ASCII files. A /A or /B switch applies to the file it is placed after and to all subsequent files until the next /A or /B switch.

A /A or /B switch on the destination file determines whether or not an ALT-Z is placed at the end of the file. (Source files that are read while /A is in effect have ALT-Z stripped off. If /A is in effect when the file is written, a single ALT-Z is put back.) Thus, an additional ALT-Z would be appended with a command such as—

COPY A.ASM/B B.ASM/A ↵

The /B on the first file specifier in this command prevents the ALT-Z from being stripped, and the /A on the second file specifier inserts an ALT-Z. The primary practical application may be the reverse, where an ALT-Z is stripped from the file with a command such as—

COPY PROG.COM/B + ERRS.TXT/A NEWPROG.COM/B ↵

In this example, the file ERRS.TXT, which was generated by an editor, is actually considered constant data (error messages) by the program it is being appended to. Since the result is a .COM file, an ALT-Z at the end is not needed.

The /A and /B switches are processed whether or not files are concatenated. When not concatenating, the COPY command defaults to binary copy. If the /A switch is used, the resulting file may end at the first end-of-file mark—for example with a command such as—

COPY A.TXT/A B.TXT ↵

If the file A.TXT in the preceding command contained an embedded ALT-Z, the resulting file, B.TXT, would be shorter than A.TXT and would contain one ALT-Z, the last character of the file.

Concatenation with Ambiguous File Names

You can also concatenate file names that contain wild-card characters. For example, the command—

COPY *.LST COMBIN.PRN ↵

would combine all files matching *.LST into one file called COMBIN.PRN.

Several individual concatenations can also be performed. For example, the command—

COPY *.LST + *.REF *.PRN ↵

would combine each file that matched *.LST with the corresponding .REF file. The resulting files retain their original file names, but are given the extension .PRN. For example, in the preceding command, FILE1.LST would be combined with FILE1.REF to

form FILE1.PRN, XYZ.LST would be combined with XYZ.REF to form XYZ.PRN, and so on. The command—

COPY *.LST + *.REF COMBIN.PRN ↵

would combine all files matching *.LST with all files matching *.REF into one file named COMBIN.PRN.

Be careful not to enter a concatenation COPY command where one of the source files has the same name as the destination file. As each input file is found, its name is compared with the destination. If they are the same, that one input file is skipped, and the message—

Content of destination lost before copy

is printed. Further concatenation proceeds normally. This allows "summing" files, with a command like—

COPY ALL.LST + *.LST ↵

This command appends all *.LST files, except ALL.LST itself, to ALL.LST. The error message is suppressed in this case, since this is produced by a true physical append to ALL.LST.

THE DATE COMMAND 9.3

Format and Function:

The format for the DATE command is—

DATE [dd-mm-yy] ↵

or

DATE [mm/dd/yy] ↵

where mm represents the number of the month, dd represents the number of the day, and yy represents the number of the year.

(One-digit numbers may be entered for the number of the month and the number of the day.)

The function of the DATE command is to set and display the date.

Operation:

If entered without a parameter, the DATE command displays the message—

Current date is Day mm/dd/yy or dd-mm-19yy
Enter new date:

where Day represents the name of the day, mm represents the number of the month, dd represents the number of the day, and yy represents the number of the year.

Press the Return key if you do not want to change the date shown.

Optionally, the date may be given as a parameter to the DATE command, in which case no message is displayed.

Use numbers only to enter the new date. The allowable parameters are—

- 1-12 for the number of the month.
- 1-31 for the number of the day.
- 80-99 or 1980-2099 for the number of the year.

Separate the date, month, and year entries by hyphens (-) for European format or slashes (/) for American format. MS-DOS is programmed to change months and years correctly, whether the month has 31, 30, 29, or 28 days.

If the parameters or separators entered are not legal, MS-DOS displays the message—

Invalid date
Enter new date:

To solve this problem, enter a new date using legal parameters.

THE DEL COMMAND 9.4

The format for the DEL command is—

DEL filespec ↵

The function of the DEL command is to delete all files that match the specified file specifier.

Wild-card characters may be used in the file specification parameter.

If the file name given is *.*, MS-DOS displays the prompt "Are you sure?" If you type a Y in response, all files are deleted.

THE DIR COMMAND 9.5

Format and Function:

The format for the DIR command is—

DIR [**drivename:**] [**filename**[**.ext**]] [**/P**] [**/W**] ↵

The function of the DIR command is to list the files in a diskette's file directory.

Operation:

- Without parameters, DIR lists all directory entries on the default drive.

- With only a drive specification, DIR lists all entries on the diskette in the specified drive.

- With only a file name, DIR lists all files with the specified file name on the diskette in the default drive.

- With a full file specification, DIR lists all files that match that file specification.

In all cases, files are listed with their size in bytes and the time and date of their last modification.

Wild-card characters may be used in the file name and file extension parameters.

Two switches may be used with DIR. The /P switch selects page mode. With /P, display of the directory pauses after the screen is filled. To resume display of output, type any key.

The /W switch selects wide display. With /W, only file names are displayed (other file information is suppressed). File names are displayed five per line.

9.6 THE PAUSE COMMAND

Format and Function:

The format for the PAUSE command is—

PAUSE [**comment**] ↵

The function of the PAUSE command is to suspend execution of a batch file.

Operation:

Use PAUSE to allow time for necessary action—such as changing a diskette—during execution of a batch file. When COMMAND

encounters PAUSE, it displays the optional comment and the message—

Strike any key when ready . . .

Pressing any key except ALT-C resumes execution of the batch file. If you type an ALT-C, COMMAND displays the prompt—

Abort batch job (Y/N)?

If you type Y, execution of the remainder of the batch command file is aborted, and control returns to the operating system. Therefore, PAUSE can be used to break a batch file into pieces, allowing you to end the batch command file at an intermediate point.

THE REM COMMAND 9.7

The format for the REM command is—

REM comment ↵

The function of the REM command is to display a comment during execution of a batch file.

The only delimiters for the comment are any one of the three legal delimiters to start the comment (blank space, tab, or comma).

THE REN COMMAND 9.8

Format and Function:

The format for the REN command is—

REN [drivename:]filename[.ext] filename[.ext] ↵

The function of the REN command is to rename a file or files.

Operation:

The first file specifier must designate a drive if the file resides on a diskette in a drive other than the default drive. (Any drive designation given for the second file specifier is ignored. The file remains on the diskette where it currently resides.)

Wild-card characters may be used in either parameter. A wild-card character causes a one-to-one correspondence between files specified by the first parameter and those specified by the second parameter.

For example, the command—

REN *.LST *.PRN ↵

would change the extension of all files with the .LST extension to .PRN.

As another example, the command—

REN B:ABODE ?D?B? ↵

would rename the file ABODE on drive B to ADOBE (the file would remain on drive B).

9.9 THE TIME COMMAND

Format and Function:

The format for the TIME command is—

TIME [hh:mm[:ss]] ↵

where hh represents the number of the hour, mm represents the number of the minute, and ss represents the number of the second. (One-digit numbers may be entered for the numbers of the hour, minute, and second.)

The function of the TIME command is to set and display the time.

Operation:

If TIME is entered without parameters, MS-DOS displays the message—

Current time is hh:mm:ss.cc
Enter new time:

where hh represents the number of the hour, mm represents the number of the minute, ss represents the number of the second, and cc represents the number of the half-second.

Press the Return key to leave the time set as shown.

If TIME is entered with parameters, no message appears.

Use numbers to enter the new time. The allowable parameters are—

- 00-23 for the number of the hour.
- 00-59 for the number of the minute.
- 00-59 for the number of the second.

The hour, minute, and second entries must be separated by colons (:). If the parameters entered are not legal, MS-DOS displays the message—

Invalid time
Enter new time:

To solve this problem, enter a new time using legal parameters.

THE TOD COMMAND 9.10

The TOD command displays the current date and time.

9.11 THE TYPE COMMAND

The format for the TYPE command is—

TYPE filespec ↵

The function of the TYPE command is to display the contents of the specified file on the console screen.

The only formatting performed by TYPE is that tabs are expanded to spaces consistent with tab stops every eighth column. Note that display of binary files causes alternate characters to be sent to your computer, including bells, form feeds, and escape sequences.

9.12 SYSTEM AND USER DRIVES

This feature allows the user to make distinct the default (user) drive and the drive (system) from which commands are obtained. The user drive may be changed without disturbing the system drive, allowing the user to access data without losing the ability to group programs and batch files on a single drive. The syntax follows COMMAND standard option specification.

a: → change the default drive to a: and system drive to the default drive.

d:/u → change only the default drive to a:, leaving the system drive unchanged.

c:/s → change the system drive but leave the default drive unchanged.

e:/s/u is equivalent to e:/u.

The ? command will display the current system drive, if it is not the default drive.

10

INTRODUCTION

The CP/M-86 operating system provides a way for you to communicate with your computer. CP/M-86 must be loaded for you to use the application programs that operate with CP/M-86. Like other operating systems, CP/M-86 manages the basic functions used by these programs.

Chapters 10 through 14 describe how to use CP/M-86 files, commands, and utilities. You can use CP/M-86 commands or utilities whenever you are using the operating system. You know you are using the operating system when you see the DOS command prompt—a drive letter name followed by >.

(Note: If you have a hard disk, refer to Appendix A for information on the CP/M-86 emulator.)

CP/M-86 CAPABILITIES 10.1

CP/M-86 operating system commands work with files created by an application program. The powerful CP/M-86 utilities can be used as extra capabilities (or as alternatives) for application program operations in managing disk files. With CP/M-86 you can perform the following tasks (plus more complex tasks described in this section):

- Display summarized information about CP/M-86 functions (HELP).
- Display and set time of day (TOD).
- Prepare diskettes for use on your computer (FORMAT).
- Copy the contents of one diskette onto another (DCOPY).
- Copy the operating system tracks from one diskette to another (BOOTCOPY).

- Check the size and read/write status of disk files (STAT).
- Display a diskette directory or desired parts of a directory (DIR and DIRS).
- Display the contents of a disk file on the screen (TYPE).
- Erase and rename files (ERA and REN).
- Copy or move files from one diskette to another (PIP).
- Output files to a peripheral device (such as a printer) (PIP).
- Execute a series of commands with one command (SUBMIT).
- Move files between subdirectories (USER and PIP).

10.2 SECTION CONVENTIONS

This section uses the following conventions:

- In examples, two-color printing differentiates computer messages from user entries. Computer output is black, and user entries are gray.
- In examples and command-format illustrations, nonprinting ASCII characters, such as carriage returns, appear as symbols. For instance, ↵ represents a carriage return; ␣ represents a space.
- The ALT (Alternate function) key acts as the "Control" key on your computer. In examples in this manual, ALT-key sequences are represented with a caret (^) followed by the ALT character. For example, ALT-C appears as ^C. (Use of the ALT key is described in 11.3.)
- Command names, file names, and system prompts or responses embedded in text appear in upper case.

- When command formats and standard user entries appear in text for the first time, they are presented in bold-faced single lines.
- In command formats:
  - —Braces ({ }) indicate that one item in the enclosed group must be selected.
  - —A vertical bar (|) separates alternatives.
  - —Brackets ([ ]) indicate that the enclosed item(s) are optional.
  - —An ellipsis in brackets ([...]) indicates that the preceding parameter can be repeated any number of times. A comma preceding the ellipsis ([,..]) indicates that each parameter must be separated from the others by a comma.
  - —General forms (which represent specific entries to be supplied by the user—such as file names, drive names, and device names) appear as single words, such as filename, drivename, logicaldevice. In command and error message formats, general forms are underlined.
- The term system diskette refers to any diskette that contains the CP/M-86 operating system.

The following example command format illustrates some of the conventions presented in this section.

{dir|dirs} [drivename:|filespecifier] ↵

The command stem, DIR or DIRS, is enclosed in braces to indicate that one of these alternatives must be included in the command. The command tail elements DRIVENAME: and FILESPECIFIER are enclosed in brackets to indicate that they are mutually exclusive options.

11

CP/M-86 OVERVIEW

CP/M-86 is an operating system for your computer. The structure of the CP/M-86 file system allows dynamic allocation of file space and both sequential and random file access. Using this file system, many programs can be stored in both source and machine-executable form on one diskette.

COMPONENTS 11.1

There are four main components of CP/M-86: (1) the Basic Input/Output System (BIOS); (2) the Basic Diskette Operating System (BDOS); (3) the Console Command Process (CCP); and (4) the Transient Program Area (TPA). Component functions follow:

- BIO—provides the primitive input/output interface to the diskette drives and input/output devices.
- BDOS—controls the diskette drives and file system.
- CCP—reads the keyboard and processes commands.
- TPA—holds programs loaded from diskette.

INPUT/OUTPUT DEVICES 11.2

CP/M-86 performs its input and output based on the four "logical" devices described in Table 11-1. A logical device is the name of a device (e.g., LST:) that programmers or operators refer to when doing input or output processing. Special-purpose programs, called drivers, handle the transfer of data to and from these logical devices. These drivers interface with specific physical devices, which are actual input/output devices such as disk drives and line printers.

The operator can assign a physical device to a logical device name through the STAT command (as described in 13.4). For example, the operator can direct output to any of four physical devices by changing the physical-to-logical device association, as described in 13.4.8.

Table 11-1 describes the CP/M-86 logical and physical devices.

The names of the actual devices attached to your computer may or may not correspond to the physical device names listed in Table 11-1. For example, the device TTY: is actually an RS-232-C serial communications port to which a printer, plotter, or modem might be attached. The driver programs in the BIOS define the correspondence of physical device to actual device.

Table 11-1: Logical and Physical Devices

DEVICE TYPE/NAME	DESCRIPTION
Logical Devices	
CON:	Console device—the principal interactive console which communicates with the operator. Typically, CON: is a device such as a CRT or teletype.
LST:	List device—the principal listing device; usually a hard-copy device, such as a printer or teletype.
AXI:	Auxiliary input device.
AXO:	Auxiliary output device.
Physical Devices	
TTY:	Serial output-port A (teletype-style printer—RS-232-C)
CRT:	Keyboard and cathode ray tube display
LPT:	Parallel port printer (Centronics)
UL1:	Serial printer—port B (RS-232-C)
BAT:	Batch mode-reader (AXI:) as input; a printer (LST:) as output.
UC1:	External console (to be developed)
PTR:	High speed read (to be developed)
UR1:	(To be developed)
UR2:	(To be developed)
PTP:	High speed punch (to be developed)
UP1:	(To be developed)
UP2:	(To be developed)

BASIC OPERATING PRINCIPLES AND NOTES 11.3

This section (1) describes basic operating principles for using CP/M-86 commands and (2) notes certain general characteristics of the operating system. Some of the operating principles are expanded in Chapter 12.

- Once CP/M-86 is loaded (as described in 12.1), the console displays the letter name of the default drive, followed by the command prompt >. At the operating-system level, CP/M-86 always displays the name of the default drive with the system command prompt (e.g., A> or B>).

- The operator initiates CP/M-86 functions by entering commands at the keyboard. The CP/M-86 commands and utility programs that can be used to manipulate the data contained on diskettes are described in Chapters 13, 14, and 15.

- When CP/M-86 does not recognize a command or part of a command, the system repeats the first unrecognized portion of the command, followed by a question mark.

- The "default drive" is the currently selected drive, the drive to or from which CP/M-86 is recording or obtaining data. Commands act on the diskette in the default drive, unless the operator specifies another drive name in the command. Also, commands load from the default drive unless another drive is specified.

- Commands the user enters in response to the > prompt are referred to as "system-level" commands.

- All the commands described in this section can be entered in upper or lower case. CP/M-86 automatically converts commands entered in lower case at the keyboard into upper case.

- Your ALT (Alternate function) key has two functions:

  —It displays the symbol or invokes the function shown on the front face of another key when both keys are pressed at once.

—It acts as the Control key (for example, the function generally referred to as a Control C is an ALT-C on your computer and is accomplished by striking C while keeping the ALT key depressed).

11.4 ENTERING AND MODIFYING CP/M-86 COMMANDS

You communicate with the operating system by entering CP/M-86 commands at the keyboard. Pressing the Return key at the end of a command line sends the command to the operating system. A command line can be up to 127 characters long.

You can modify CP/M-86 commands at any time during entry, until the Return key is pressed. To modify the command line, use the ALT-key functions described in Table 11-2.

Table 11-2: ALT-Key Command-Line Editing Functions

ALT CHARACTER	FUNCTION
^E	Causes physical end of line; display is shifted to beginning of next line, but line is not sent to CPU until Return key is pressed. Useful for entering command lines that are longer than physical line on screen.
^H or Backspace key	Moves cursor back one character position and deletes last character entered.
^J	Terminates input (line feed).
^M or Return key	Terminates input (carriage return).
^R	Redisplays current command line.
^U	Cancels current command line.
^X	Backspaces (deletes) to beginning of current line.
^Z	ASCII end-of-file character.

FILE SYSTEM 11.5

Your computer stores information on diskettes in the form of files; a file is one or a group of related characters. A single file can be any length, up to the data storage capacity of a diskette. All CP/M-86 file-related functions can be used in user-written programs.

File Specifiers 11.5.1

A CP/M-86 file is identified by its file specifier, which consists of one to three parts: a file specifier must contain a file name; it may also contain a file extension and/or a drive name (the name of the drive containing the diskette on which the file is recorded). If the drive name is omitted from a file specifier, CP/M-86 assumes that the file is on the diskette in the default drive.

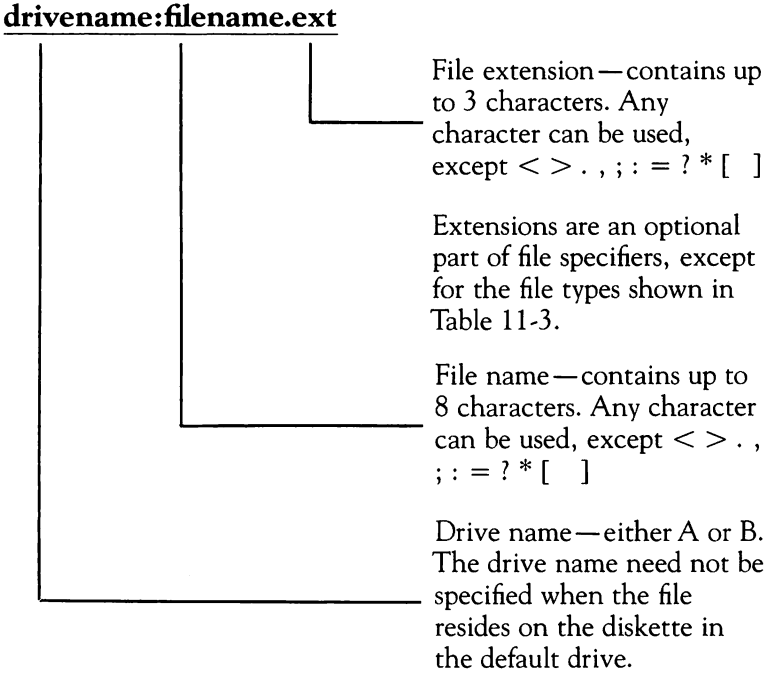
The three elements of a file specifier are arranged in the following sequence, with no intervening spaces:

- Drive name—one letter followed by a colon.
- File name—one to eight characters.
- File extension—zero to three characters preceded by a period.

Characters in a file specifier may be entered in upper or lower case. The following characters may not be used in a file name or a file extension: < > . , ; : = ? * [ ]

Examples and command formats in this section present file specifier elements as follows: "filespecifier" represents a file specifier, "drivename" represents a file specifier's drive name, "filename" represents a file name, and "ext" represents a file extension. The three parts of a file specifier are illustrated in Figure 11-1 and are then further described.

11-1: File Specifier Structure



11.5.2 CP/M-86 File Extension Conventions

A file specifier's file extension typically describes the form of the data in the file. Conventions govern some types of files, and some languages and application software packages assign file extensions automatically. For example, BASIC-86 assigns the extension .BAS to programs saved from that language. In addition, CP/M-86 defines the meanings of several file extensions, as presented in Table 11-3.

Files can also be assigned extensions at the operator's discretion. For example, an operator might use the extension .TXT for all text files.